DIGITAL ZOOM-OUT PROCESSING APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a digital zoom-out processing apparatus, and more particularly, to an apparatus for performing digital zoom-out by synthesizing a plurality of field or frame image information using motion information.

2. Description of the Related Art

Conventional digital cameras have a digital zoom function which provides a zooming effect by digitally processing a given input image signal independent of an optical lens.

Digital zoom processing includes magnification of an input image and reduction thereof. FIGS. 1A-1C illustrate a digital zoom function, in which FIG. 1A is a received original image, FIG. 1B is a magnification of portion of the received image, and Fig. 1C is a reduction of the received image. In the present invention, for convenience of explanation, magnification of a received image signal will be referred to as digital zoom-in, and reduction of the received image signal will be referred to as digital zoom-out.

As shown in FIGS. 1A and 1B, the result of the digital zoom-in can be obtained entirely from the received image. However, the result of the digital zoom-out is smaller than the received original image, as illustrated by FIG. 1C in comparison to FIG. 1A, so that an area on a display screen other than the digitally zoomed-out image must be processed as blank or require a different process.

Therefore, conventional digital cameras have a digital zoom-in function but do not have a digital zoom-out function.

SUMMARY OF THE INVENTION

To solve the above problems, an objective of the present invention is to provide a digital image processing apparatus having a digital zoom-out function.

Accordingly, to achieve the above objective, the present invention provides a digital zoom-out apparatus for zooming out a received image signal in accordance with a given

magnification, the apparatus comprising: an image signal storage unit for storing a plurality of frames or field image signals; a motion information detector for detecting the motion information between two image signals; and a record and control unit for zooming out received frame or field image signals in accordance with the given magnification, for recording zoomed-out image signals in the image signal storage unit, and for controlling the location in the image signal storage at which the zoomed-out image signals are to be recorded.

The digital zoom-out apparatus can obtain a digital zoomed-out image by zooming out a plurality of received frame or field images and synthesizing zoomed-out images according to the degree of overlapping between the zoomed-out images.

BRIEF DESCRIPTION OF THE DRAWINGS

The above objective and advantage of the present invention will become more apparent by describing in detail a preferred embodiment thereof with reference to the accompanying drawings, in which:

FIGS. 1A-1C show pictures for illustrating a digital zoom function;

FIG. 2 is a block diagram illustrating the general function of a digital camera;

FIG. 3 is a block diagram illustrating the configuration of a digital camera adopting a digital zoom-out processing apparatus according to the present invention;

FIGS. 4A through 4G are pictures for illustrating the operation of the apparatus shown in FIG. 3;

FIG. 5 is a conceptual view illustrating the operation of the motion information detector 32 shown in FIG. 3; and

FIG. 6 shows an example in which a camera photographs an image, which is larger than the angle of view, using the apparatus shown in FIG. 3.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

A digital image processing apparatus according to the present invention accomplishes a digital zoom-out function by synthesizing a plurality of field or frame images using hand jittering correction information.

In a digital camera shown in FIG. 2, a charge coupled device (CCD) 20 converts an optical signal received of an object to an electrical signal, and an analog-to-digital converter (ADC) 22 converts the electrical signal received from the CCD 20 into a digital signal. A signal processor 24 processes the digital electrical signal provided by the ADC 22 to generate a digital image signal. The digital image signal output from the signal processor 24 is converted into an analog image signal by a digital-to-analog converter (DAC) 26, and the analog image signal is output to a view finder (not shown) or a liquid crystal display (not shown).

FIG. 3 is a block diagram illustrating the configuration of a digital camera adopting a digital zoom-out processing apparatus according to the present invention. In FIG. 3, the same reference numerals are assigned to members for performing the same operations as those shown in FIG. 2, and the same members as those in FIG. 2 will not be described again.

The digital camera shown in FIG. 3 further includes a digital zoom-out processing unit 300 in addition to the elements shown in FIG. 2. The digital zoom-out processor 300 includes an image signal storage unit 30, a motion information extraction unit 32, and a record and control unit 34.

The image signal storage unit 30 stores a plurality of field or frame image signals. Typically, the image signal is of the non-interlaced scanning type consisting of frames. However, an interlaced scanning type may be used, dividing a frame into two fields. For convenience of explanation, the present invention describes processing of frame image signals as an example. Processing of field image signals of the interlaced scanning type is the same as processing of frame image signals except for the difference in the amount of information that is processed.

The storage position (the location in memory) of a frame image signal in the image signal storage unit 30 is determined by the record and control unit 34. The record and control unit 34 zooms out a received frame image signal according to a zoom-out magnification, and controls the location in the image signal storage unit 30 at which a received frame image signal is stored, with reference to motion information provided by the motion information detector 32.

The motion information detector 32 detects motion information by comparing a previously-received frame image signal with a currently-received frame image signal, or by

using a device such as an accelerometer or a gyroscopic sensor. The detected motion information is provided to the record and control unit 34.

The operation of the apparatus shown in FIG. 3 is similar to a jigsaw puzzle. When a digital camera user photographs a scene several times to have several different pictures having overlapping portions, the digital camera zooms out received images, determines the degree of duplication between the received images, and arranges zoomed-out images so that the zoomed-out images are matched with each other.

FIGS. 4A through 4G are pictures for illustrating the operation of the apparatus shown in FIG. 3. FIG. 4A is a scene intended to be photographed. FIGS. 4B through 4D are pictures in which parts of FIG. 4A are photographed. FIGS. 4E and 4F are pictures in which the pictures of FIGS. 4B through 4D are zoomed out and synthesized using the previous image signal and motion information. FIG. 4G is a final picture obtained through the processes shown in FIGS. 4E and 4F. It can be seen that FIG. 4G is a picture obtained by zooming out FIG. 4A.

FIG. 5 is a conceptual view illustrating the operation of the motion detector 32 shown in FIG. 3. The motion information detector 32 detects motion information between two received frame screens. As shown in FIG. 5, motion between two screens A and B includes a horizontal motion i and a vertical motion j. The hatched portion of FIG. 5 is a portion where the two screens A and B overlap each other. Thus, when the screen A is recorded, and the screen B is then recorded at a location isolated by i and j from the screen A, a synthesized screen of the screens A and B can be obtained.

The motion information can be obtained by comparing the previous received frame image signal with a current received frame image signal, by using a device such as an accelerometer, a gyroscopic sensor, or by other methods.

The record and control unit 34 zooms out a received frame image signal according to a zoom-out magnification, and then stores the resultant signal in the image signal storage unit 30 with reference to motion information provided by the motion information detector 32. At this time, duplicate portions can maintain the previous image signal, or replace the previous image signal with a new image signal, an interpolation signal of the previous image signal and the new image signal, or the like.

FIG. 6 shows an example in which a camera photographs an image, which is larger than the viewing angle, using the apparatus shown in FIG. 3. When a camera is very close to an object and the distance between them cannot be lengthened as shown in FIG. 6, the apparatus shown in FIG. 3 can be used to easily photograph an object which is larger than the viewing angle of the camera.

As described above, a digital zoom-out apparatus according to the present invention accomplishes a digital zoom-out function, thus enabling the formation and processing of a synthesized large-area image of units of one screen.

Although the digital zoom-out apparatus was described for use with a digital camera, it can also be adopted in digital video cameras that support an output of still images, to create a large-area panoramic image.

It is contemplated that numerous modifications may be made to the digital zoom-out apparatus of the present invention without departing from the spirit and scope of the invention as defined in the following claims.